

Oct. 1, 1935.

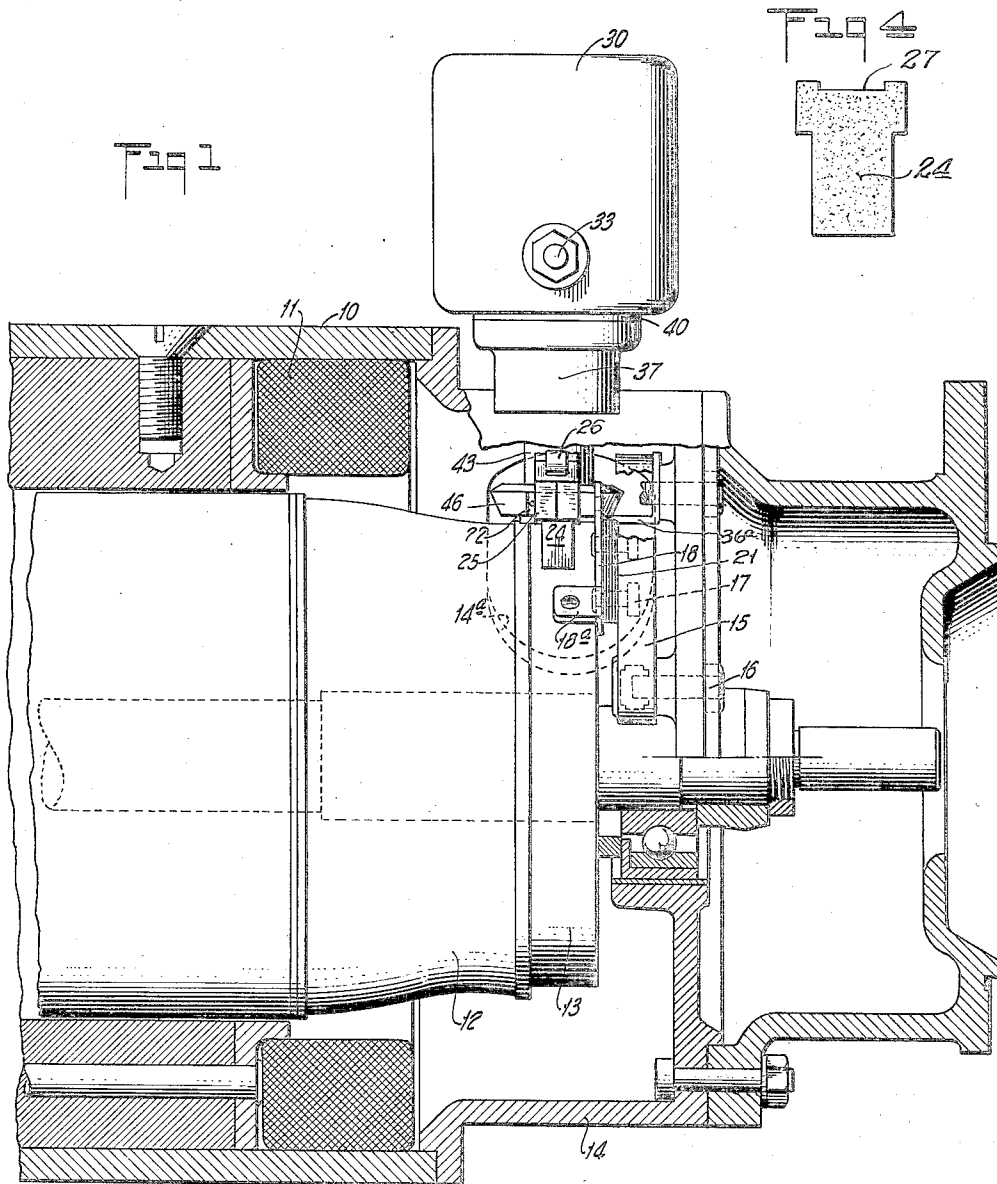
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2,016,173

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Filed April 29, 1932

2 Sheets-Sheet 1



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# UNITED STATES PATENT OFFICE

2,016,173

## BRUSH MECHANISM FOR DYNAMO-ELECTRIC MACHINES

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Application April 29, 1932, Serial No. 608,304

33 Claims. (Cl. 171—324)

This invention relates to dynamo-electric machines, and more particularly to brush mechanism for such machines.

One of the objects of the present invention is to provide, for machines of the above character, novel brush mechanism for operatively connecting the machine to an electric circuit and for interrupting the flow of current between said machine and circuit.

Another object of the invention is to provide novel brush-lifting mechanism for a dynamo-electric machine, said mechanism being so constituted that the brushes of the machine may be moved from inoperative to operative position in such a manner as to avoid damage to the commutator, or collector rings, associated with said brushes.

Another object is to provide a novel brush-lifting mechanism adapted to be controlled from a point remote from the dynamo-electric machine, said mechanism being so constructed that the brushes will be brought into contact with the commutator, or collector rings, without shock or damage to the elements of the machine.

Still another object is to provide a brush mechanism of the above type embodying a novel brush holder so constructed and arranged that the brushes are resiliently carried thereby to aid in preventing shock or damage thereto and to the commutator or slip ring with which the brushes are associated, and also to facilitate the replacement of the brushes when necessary.

The above and other objects and advantages of the invention will appear more fully hereinafter from a consideration of the detailed description and the accompanying drawings illustrating one embodiment of the invention. It is to be expressly understood, however, that the drawings are for the purpose of illustration only and are not designed as a definition of the limits of the invention, reference being had primarily for this purpose to the appended claims.

In the drawings wherein like reference characters refer to like parts throughout the several views:

Fig. 1 is a partial longitudinal section of a dynamo-electric machine embodying the present invention;

Fig. 2 is a top plan view, with parts broken away and partly in section, illustrating the mechanism shown in Fig. 1;

Fig. 3 is a transverse half section taken on lines 3—3 of Fig. 2;

Figs. 3a and 3b are detail perspective views of one form of novel brush holder used in the ap-

paratus embodying the present invention; and

Fig. 4 is a detail elevation of one of the brushes showing the proportions thereof.

In the form shown, the novel brush mechanism of the present invention is operatively associated with a dynamo-electric machine having a casing 10, a field winding 11, a rotor 12 and a commutator, or slip ring 13. These elements of the structure may be of any suitable type and per se constitute no part of the present invention. Casing 10 is provided with an end section 14 which encloses the commutator, or slip ring, and the novel brush mechanism.

Referring more particularly to Figs. 2 and 3, it will be noted that section 14 carries a pair of insulating members 15 that are preferably formed of "bakelite" or similar material and are removably secured to the inner surface of said casing section as by means of screws 16. Attached in any convenient manner, as by means of rivets 17, to each insulating member 15 is a current-carrying bracket 18 having an inwardly extending ear 18a which receives a binding post 19 (Fig. 3) for an electrical conductor 20. In the form shown, bracket 18 is laterally spaced from member 15 by means of washers 21 which may be formed of mica or other suitable material.

The inner end of each bracket 18 is provided with a pivot pin or rod 22 on which is pivotally mounted an arm 23 to the outer end of which is removably and resiliently attached a brush 24. In the illustrated embodiment and more particularly as shown in Figs. 3a and 3b, arm 23 is provided with a tab which is bent up to form a sleeve 25 in which the brush 24 is carried, the brush being held in an operative position in the sleeve by means of a leaf spring 26 that is pivotally secured at 26a to the top of, and extends beyond the outer end of, the arm 23. The outer end of spring 26 passes over the top of the brush 24 and is seated in a recess 27 formed therein, whereby the brush is yieldingly and removably held in operative position on the arm. The brush 24 has its upper portion enlarged, as shown in Fig. 4, in order to prevent it from slipping through the sleeve 25. It will be seen that when it is desired to replace the brush 24, the outer end of the leaf spring 26 is manually lifted out of the recess 27 of the brush and swings to the left or right on the pivot 26a thereby clearing the brush to permit ready removal thereof. After the brush is replaced, the outer end of the leaf spring 26 is lifted and moved angularly on its pivot toward the center of the brush and then the spring is

released, whereupon the brush becomes automatically locked in the holder 25 by virtue of the seating of the end of the spring in the recess 27 of the brush. Casing section 14 is preferably provided with openings 14a adjacent the brushes in order to facilitate inspection and replacement of the latter.

Means are provided for normally holding the brushes in raised or inoperative position and, as is well understood in the art, when said brushes are thus held, the dynamo-electric machine (a generator in the illustrated embodiment) is disconnected from its associated circuit. For this purpose, each arm has associated therewith a spring 28 which is wound around the pivot pin 22, one end of said spring having engagement with the lower surface of arm 23 while the other end of the spring bears against a stop 29 which projects laterally from bracket 18 immediately below the pivot pin. It will thus be seen that spring 28 tends at all times to hold brush 24 in inoperative position out of engagement with the commutator 13 if the invention is employed in a direct current machine.

Means are provided for moving the brushes to operative position against the tension of springs 28, and are so constructed that the brushes are yieldingly moved into engagement with the commutator in such a manner as to avoid damage to the latter. In the form shown, said means include a solenoid 30 embodying a casing 31, a winding or coil 32 and binding posts 33 adapted to be connected to a suitable source of current, the energization of said coil 32, by said source of current, being controlled by a suitable switch (not shown). In most installations, the switch will be located at a distance remote from solenoid 30. The latter also embodies a plunger constituted by a movable armature 34 to which is secured a rod 35 having an enlarged head 36. The rod or plunger 35 is supported within the solenoid in any suitable manner as by means of a bracket or projecting finger 36a carried by the frame 14.

In the illustrated embodiment, the solenoid is fixedly secured to casing section 14 of the generator by means of a bracket 37 provided with suitable openings 38 to receive screws 39. To insure water-tightness, the bracket 39 carries a cover plate 40 removably attached to said bracket as by means of bolts 41. The casing or housing 31 of the solenoid may be welded or secured in any suitable manner to cover plate 40. As shown more clearly in Fig. 3 plunger 34, 35 is disposed radially of the substantially cylindrical casing 10, 14 and is surrounded by a sleeve 42 which is located centrally of coil 32 and extends through casing 31, cover plate 40, bracket 37 and into an opening provided in the casing section 14.

Surrounding rod 35 and longitudinally movable with respect thereto is a sleeve 43 which is preferably formed of bakelite, or other suitable insulating material, and which is provided with an enlarged chamber 44 adjacent the lower end thereof. A coil spring 45 is positioned in chamber 44 and surrounds rod 35, the lower end of the spring resting against head 36 of said rod and the upper end of the spring bearing against the annular shoulder formed by the upper wall of chamber 44. Spring 45 yieldingly holds sleeve 43 in a predetermined position longitudinally of rod 35. The lower end of sleeve 43 is enlarged to form an annular shoulder 46 which projects beneath and is engaged by the inner ends of

arms 23, said arms being yieldingly held in engagement with said shoulder 46 by springs 28 and 45. It will thus be seen that springs 28 act through arms 23 to resist upward movement of sleeve 43 and, through spring 45, the upward movement of plunger 34, 35.

In operation, the switch (not shown) is closed to energize coil 32, whereupon plunger 34, 35 is moved outwardly relative to casing section 14. The movement of the plunger is yieldingly transmitted through spring 45 to sleeve 43, 46, whereby the latter is moved upwardly and the inner ends of arms 23 are swung upwardly against the tension of springs 28. The swinging movement of the inner ends of arms 23 is effective to move brushes 24 into engagement with the commutator (or slip ring). Due to the yielding connection which includes sleeve 43 and spring 45, and also due to the action of the leaf spring 26, brushes 24 are yieldingly moved into engagement with the commutator whereby damage to the latter, such as scoring, is prevented. When it is desired to disconnect the dynamo-electric machine from its associated circuit (not shown), the control switch, referred to above, is opened whereupon coil 32 is de-energized and springs 28 and 45 are effective to return the parts to the inoperative position illustrated in Fig. 3.

There is thus provided a novel brush mechanism which is so constructed that the brushes may be moved from inoperative to operative position without damage to the parts of the machine, the control being located at a distance from the machine if desired. The sharp, positive movement resulting from direct solenoid action on brush-carrying arms is avoided and the flow of current between the dynamo-electric machine and its associated circuit is readily controlled. There is also provided a novel brush holder whereby the operation of the entire mechanism is rendered more efficient.

The mechanism is particularly adapted for use as a cut-out for the high voltage side of multi-current, engine-driven radio generators such as are extensively employed on aircraft. As will be understood by those skilled in the art, however, the present invention is not limited to such use and may be advantageously employed in various types of dynamo-electric machines due to its ready installation and dependable operation. Various changes may be made in the details of construction and arrangements of parts without departing from the invention. Accordingly, reference will be had primarily to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In apparatus of the class described, a brush, a pivotally mounted arm carrying said brush, resilient means operatively engaging the arm for holding the brush in inoperative position, a sleeve having a portion thereof engaging said arm, a solenoid having a core, and resilient means interposed between said core and sleeve, said solenoid being adapted to raise said sleeve whereby said brush is moved to operative position.

2. In a generator of the commutator type, a plurality of brushes, spring-pressed arms for normally holding said brushes out of engagement with the commutator, a solenoid having a movable plunger, and means including a sleeve surrounding said plunger, said sleeve having an enlarged head engaging each of said arms, and said solenoid being operative through said means to

move said brushes into engagement with the commutator.

3. In a generator of the commutator type, a plurality of pivotally mounted arms, brushes carried by said arms for engagement with the commutator, resilient means operatively connected to said arms, a solenoid having a movable plunger, a sleeve surrounding said plunger and having an enlarged portion adapted to engage said arms, and a coil spring interposed between said sleeve and plunger for transmitting movement of the plunger to said sleeve.

4. In apparatus of the class described, a pivotally mounted arm, a brush removably secured to one end of said arm, a sleeve having an enlarged portion engaging the other end of said arm, a solenoid having a plunger extending through said sleeve, resilient means interposed between said sleeve and plunger, and resilient means for holding said arm in engagement with the enlarged portion of said sleeve.

5. In a dynamo-electric machine, a substantially cylindrical casing, a solenoid mounted on said casing and having a plunger radially disposed with respect to the casing, an insulating sleeve surrounding said plunger, yielding means for normally holding said sleeve in a predetermined position with respect to said plunger, arms engaging said sleeve, brushes carried by said arms, and yielding means for opposing movement of the sleeve and plunger in an outward direction relative to the casing.

6. In a dynamo-electric machine, a casing, a solenoid having a plunger mounted on the casing, an insulating sleeve surrounding the plunger, a spring interposed between said plunger and sleeve, arms pivotally mounted on the casing and having engagement with said insulating sleeve, resilient means normally holding said arms in a predetermined position relative to the casing, and brushes carried by said arms.

7. In a dynamo-electric machine of the commutator type, a brush for the commutator, an arm carrying said brush, means for yieldingly holding said brush in inoperative position, a solenoid having a core, a yielding connection between said core and said arm for moving said brush to operative position, and resilient means pivoted on said arm for holding the brush thereon and for preventing shock to said brush upon its being moved to operative position.

8. In a dynamo-electric machine, a brush-holder, a brush, combined electrical and resilient means for moving said brush into operative position, resilient means for opposing said movement of the brush, and another resilient means pivotally mounted on the brush-holder for preventing shock to the brush upon its being moved into operative position.

9. In a brush operating mechanism of the type embodying remotely operated means for actuating the brushes into engagement with a cooperating commutator of a dynamo-electric machine, the combination of a brush-holder pivotally mounted for actuation by said actuating means and comprising an arm having a sleeve at one end thereof into which a brush is adapted to be inserted, a brush in said sleeve and having a portion greater than the sleeve portion to prevent said brush from slipping through said sleeve and also having a recess therein, and a spring secured to said arm and having one end seated in the recess of the brush to hold the latter in the sleeve and to provide resiliency thereto for preventing excessive impact of the brush against

the commutator upon operation of the actuating means.

10. In a brush operating mechanism of the type embodying remotely operated means for actuating the brushes into engagement with a cooperating commutator of a dynamo-electric machine, the combination of a brush-holder pivotally mounted for actuation by said actuating means and comprising an arm having a sleeve at one end thereof into which a brush is adapted to be inserted, a brush in said sleeve and having a portion greater than the sleeve portion to prevent said brush from slipping through said sleeve and also having a recess therein, a spring secured to said arm and having one end seated in the recess of the brush to hold the latter in the sleeve and to provide resiliency thereto for preventing excessive impact of the brush against the commutator upon operation of the actuating means, and means normally maintaining said brush-holder in non-engaging position.

11. In a brush operating mechanism of the type embodying remotely operated means for actuating the brushes into engagement with a cooperating commutator of a dynamo-electric machine, the combination of a brush-holder pivotally mounted for actuation by said actuating means and comprising an arm having a sleeve at one end thereof into which a brush is adapted to be inserted, a brush in said sleeve and having a portion greater than the sleeve portion to prevent said brush from slipping through said sleeve and also having a recess therein, and a spring secured to said arm and having one end seated in the recess of the brush to hold the latter in the sleeve and to provide resiliency thereto for preventing excessive impact of the brush against the commutator upon operation of the actuating means, said spring being pivoted on said arm so that upon having its end lifted out of the recess in the brush it may be shifted to one side or the other of the sleeve to facilitate the insertion and removal of the brush.

12. In a brush operating mechanism of the type embodying remotely operated means for actuating the brushes into engagement with a cooperating commutator of a dynamo-electric machine, the combination of a brush-holder pivotally mounted for actuation by said actuating means and comprising an arm having a sleeve at one end thereof into which a brush is adapted to be inserted, a brush in said sleeve and having a portion greater than the sleeve portion to prevent said brush from slipping through said sleeve and also having a recess therein, a spring secured to said arm and having one end seated in the recess of the brush to hold the latter in the sleeve and to provide resiliency thereto for preventing excessive impact of the brush against the commutator upon operation of the actuating means, said spring being pivoted on said arm so that upon having its end lifted out of the recess in the brush it may be shifted to one side or the other of the sleeve to facilitate the insertion and removal of the brush, and means normally maintaining said brush-holder in non-engaging position.

13. In a dynamo-electric machine of the commutator type, a plurality of brushes for said commutator, pivotally mounted arms carrying said brushes at one end, respectively, and having their opposite ends adjacent each other in relatively close spaced relation, yielding means for holding said brushes out of engagement with said commutator, and combined electrical and

yielding means including a member interposed between the adjacent ends of said brush arms and engaging the latter for moving said brushes into engagement with the commutator.

14. In a dynamo-electric machine, a plurality of brushes, pivotally mounted arms carrying said brushes at one end, respectively, and having their opposite ends adjacent each other in relatively close spaced relation, resilient means for holding said brushes in inoperative position, and combined electrical and resilient means including a member interposed between the adjacent ends of said brush arms and engaging the latter for opposing said first-named resilient means and for moving said brushes to operative position.

15. In a dynamo-electric machine having a commutator, brushes for the commutator, pivotally mounted arms carrying said brushes at one end, respectively, and having their opposite ends adjacent each other in relatively close spaced relation, means secured to said brush arms for holding said brushes out of engagement with said commutator, electrical means, a member interposed between the adjacent ends of the brush arms and engaging the latter and movable by said electrical means in a direction transverse to said brush arms, and a yielding connection between said electrical means and said member whereby energization of said electrical means is effective through said connection to move said brushes to operative position.

16. In a dynamo-electric machine of the commutator type, a pair of pivotally mounted arms extending in opposite directions from a radial line of the commutator and having their inner ends closely adjacent each other on either side of said radial line, brushes carried by said arms at the outer ends thereof, resilient means associated with said arms for normally holding said brushes out of engagement with the commutator, and a member movable along said radial line and engaging the adjacent ends of said brush arms for moving the brushes into engagement with the commutator.

17. In a dynamo-electric machine of the commutator type, a pair of pivotally mounted arms extending in opposite directions from a radial line of the commutator and having their inner ends closely adjacent each other on either side of said radial line, brushes carried by said arms at the outer ends thereof, resilient means associated with said arms for normally holding said brushes out of engagement with the commutator, a member movable along said radial line and engaging the adjacent ends of said brush arms for moving the brushes into engagement with the commutator, and other resilient means carried by said brush arms and engaging said brushes for holding the latter on said arms and to provide resiliency thereto for preventing excessive impact of said brushes against said commutator.

18. In a dynamo-electric machine of the commutator type, a pair of pivotally mounted arms extending in opposite directions from a radial line of the commutator and having their inner ends closely adjacent each other on either side of said radial line, brushes carried by said arms at the outer ends thereof, resilient means associated with said arms for normally holding said brushes out of engagement with the commutator, and electrical actuating means including a member movable along said radial line and engaging the adjacent ends of said brush arms for

moving the brushes into engagement with said commutator.

19. In a dynamo-electric machine of the commutator type, a pair of pivotally mounted arms extending in opposite directions from a radial line of the commutator and having their inner ends adjacent each other on either side of said radial line, brushes carried by said arms at the outer ends thereof, resilient means associated with said arms for normally holding said brushes out of engagement with the commutator, a solenoid having a plunger movable along said radial line, and a member carried by said plunger in substantial alignment therewith and engaging the adjacent ends of said brush arms for moving the brushes into engagement with the commutator upon energization of said solenoid.

20. In a dynamo-electric machine of the commutator type, a pair of pivotally mounted arms extending in opposite directions from a radial line of the commutator and having their inner ends adjacent each other on either side of said radial line, brushes carried by said arms at the outer ends thereof, resilient means associated with said arms for normally holding said brushes out of engagement with the commutator, a solenoid having a plunger movable along said radial line, a member carried by said plunger in substantial alignment therewith and engaging the adjacent ends of said brush arms for moving the brushes into engagement with the commutator upon energization of said solenoid, and resilient means between the plunger and the member for preventing sudden impact of said brushes against said commutator.

21. In a dynamo-electric machine of the commutator type, a brush for the commutator, an arm carrying said brush, means for yieldably holding said brush in inoperative position, a solenoid having a plunger operated thereby in a radial direction with respect to the commutator, and a member carried by said plunger and movable longitudinally therewith and engaging the brush arm whereby said plunger is effective to move said member for moving the brush to operative position upon energization of said solenoid.

22. In a dynamo-electric machine of the commutator type, a brush for the commutator, an arm carrying said brush, means for yieldably holding said brush in inoperative position, a solenoid having a plunger operated thereby in a radial direction with respect to the commutator, and an insulating member carried by said plunger and movable longitudinally therewith and engaging the brush arm whereby said plunger is effective to move said member for moving the brush to operative position upon energization of said solenoid.

23. In a dynamo-electric machine of the commutator type, a brush for the commutator, an arm carrying said brush, means for yieldably holding said brush in inoperative position, a solenoid having a plunger operated thereby in a radial direction with respect to the commutator, and a member carried by said plunger and movable longitudinally therewith and having a transverse portion engaging the brush arms whereby said plunger is effective to move said member for moving the brush to operative position upon energization of said solenoid.

24. In a dynamo-electric machine of the commutator type, a brush for the commutator, an arm carrying said brush, means for yieldably holding said brush in inoperative position, a solenoid having a plunger operated thereby in a

radial direction with respect to the commutator, and an insulating member carried by said plunger and movable longitudinally therewith and having a transverse portion engaging the brush arms whereby said plunger is effective to move said member for moving the brush to operative position upon energization of said solenoid.

25. In a dynamo-electric machine of the commutator type, a plurality of brushes for said commutator, pivotally mounted arms carrying said brushes at one end, respectively, and having their opposite ends adjacent each other in relatively close spaced relation, means for yieldingly holding said brushes in inoperative position, a solenoid having a plunger operated thereby in a radial direction with respect to said commutator, and means carried by the end of the plunger between said arms and engaging the latter for moving said brushes into engagement with the commutator upon energization of the solenoid.

26. In combination, a brush holder comprising an arm having means thereon for pivotally mounting the same in cooperative relation with a commutator of a dynamo-electric machine, a brush-receiving member at one end of said arm into which a brush is adapted to be inserted, a brush in said member and having a recess therein at the top thereof, and a spring secured to said arm and having one end seated in the recess of the brush to provide resiliency thereto upon engagement thereof with a commutator.

27. In combination, a brush holder comprising an arm having means thereon for pivotally mounting the same in cooperative relation with a commutator of a dynamo-electric machine, a brush-receiving member at one end of said arm into which a brush is adapted to be inserted, a brush in said member and having a recess therein at the top thereof, and a spring secured to said arm and having one end seated in the recess of the brush to provide resiliency thereto upon engagement thereof with a commutator, said spring being pivoted on said arm so that upon having its end lifted out of the recess in the brush it may be moved laterally to one side or the other of the brush to facilitate the insertion and removal of said brush.

28. In combination, a brush holder comprising an arm having means thereon for pivotally mounting the same in cooperative relation with a commutator of a dynamo-electric machine, a brush-receiving member at one end of said arm into which a brush is adapted to be inserted, a brush in said member having an upper enlarged portion to prevent said brush from passing through said member and having a recess therein at the top thereof, and a spring secured to said arm and having one end seated in the recess of the brush to

provide resiliency thereto upon engagement thereof with a commutator.

29. In combination, a brush holder comprising an arm having means thereon for pivotally mounting the same in cooperative relation with a commutator of a dynamo-electric machine, a sleeve at one end of said arm into which a brush is adapted to be inserted, a brush in said sleeve and having a recess therein at the top thereof, and a spring secured to said arm and having one end seated in the recess of the brush to provide resiliency thereto.

30. In combination, a brush holder comprising an arm having means thereon for pivotally mounting the same in cooperative relation with a commutator of a dynamo-electric machine, a sleeve at one end of said arm into which a brush is adapted to be inserted, a brush in said sleeve and having a recess therein at the top thereof, and a spring secured to said arm and having one end seated in the recess of the brush to provide resiliency thereto, said spring being pivoted on said arm so that upon having its end lifted out of the recess of the brush it may be moved laterally to one side or the other of the brush to facilitate the insertion and removal of said brush.

31. In combination, a brush holder comprising an arm, a brush receiving member at one end of said arm into which a brush is adapted to be inserted, a brush in said member, a spring pivotally secured to said arm for lateral movement with respect thereto and having one end engaging the brush to hold the latter in said member and to provide resiliency thereto when engaging a commutator, and means on said brush for automatically locking the spring in engaged position with the brush upon said spring being brought into engagement therewith.

32. In a dynamo-electric machine of the commutator type, a brush for the commutator, an arm carrying said brush, means for yieldingly holding said brush in inoperative position, a solenoid having a plunger operated thereby along a radial line of the commutator, a member engaging said arm, and a yielding connection between said plunger and said member for moving said brush to operative position.

33. In a dynamo-electric machine, a brush holder, a brush, electrical means for moving said brush into operative position, resilient means for opposing said movement of the brush, and another resilient means pivotally mounted on the brush holder for holding the brush therein and for preventing shock to the brush upon its being moved into operative position.

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